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REF. 03-RF-00838, JLB-043-03

NO FURTHER ACCELERATED ACTION JUSTIFICATION FOR ASH PITS

PAC REFERENCE NUMBER(s) SW-133 1, 133 2, 133 4, and 1702

IHSS Reference Numbers SW-133 1, SW-133 2, SW-133 4, and PAC SW-1702

Unit Name Ash Pits

Approximate Location N748,000, E2,080,000

Date(s) of Operation or Occurrence

1950s - 1968

Description of Operation or Occurrence

In 1970, four burial sites (trenches [SW-133 1, SW-133 2, SW-133 3, and SW-133 4]) were located south of the incinerator area (IHSS 133 5) These trenches were used for disposal of ash (and noncombustible trash) from the incinerator that operated from approximately 1952 until 1968 Noncombustible trash, such as counting discs, broken glassware, and metal, was collected in a nearby dumpster and later disposed of in the trenches The trenches are approximately 150 to 200 feet long, 12 feet wide, and 10 feet deep, and have been staked with steel fence posts and surveyed Approximately 3 feet of soil covers each trench location Two additional burial trenches (PAC SW-1701 and SW-1702) were identified in 1994 (DOE 1996) based on anomalies found during a time-domain electromagnetic (TDEM) conductivity survey These two additional areas were confirmed through review of aerial photographs and samples collected from boreholes in the immediate area (Figure 1) In addition, two anomalies adjacent to Ash Pits 2 and 4 (IHSSs 133 2 and IHSS 133 4 respectively) were identified based theTDEM conductivity survey In each case, the southern most anomaly at each location was referred to as a twin investigation area as documented in the Operable Unit 5 Final Phase 1 RFI/RI Report (DOE 1996) The areas are shown on Figure 1 and are referred to as "Ghost Ash Pits"

Ash from the incinerator and "dump area" was monitored in 1959 (DOE 1992) Activities of 4,000 counts per minute (cpm) alpha and 30 millirems per hour (mr/hr) beta were observed Subsequently, the ash was buried in a trench Special air sampling of the Plant incinerator was conducted in 1958 to address concerns of burning potentially contaminated waste from Buildings 444 and 447

Physical/Chemical Description of Constituents Released

In September 1954, five ash samples from the burning of Building 991 wastes were collected The average activity of the ash was 4 5 x 10^7 disintegrations per minute per kilogram (dpm/kg) of dry ash The alpha activity of the ash was approximately 100 times higher than the usual ash samples from the incinerator

In 1956, special monitoring was performed during and after contaminated waste was burned in the Plant incinerator Ash samples indicated 1 9 grams of radioactive material (depleted uranium) per kilogram of ash Smear surveys of the incinerator before and after burning showed no increase in contamination It was estimated that approximately 30,000 cubic feet of soil and ash were buried in the trenches

Small quantities of depleted uranium-contaminated combustibles were burned along with the general combustible Plant refuse One estimate indicates that less than 100 grams of depleted uranium were in the combustibles A monthly ash sampling program was initiated in January 1962 and indicated there was 1 to 8 kilograms of depleted uranium per ton of ash (DOE 1992)

Responses to Operation or Occurrence

Sampling events were conducted from November 24, 1953, through December 9, 1954 In 1970, the locations of Ash Pits 1-1 through 1-4 were marked in the field The ash in these trenches was evaluated and considered to present no problems unless disturbed and inhaled

Fate of Constituents Released to Environment

The 2001 Annual Update for the Historical Release Report (HRR) provides an NFA determination assessment for all of the Ash Pits Based on the data and assessment provided in that update, NFAs were approved by the regulatory agencies for Ash Pit 3 (SW-133 3) and the Recently Identified Ash Pit (TDEM-1) [SW-1701] (EPA, CDPHE, 2002) Analytical data specific to the Ghost pits was submitted in the 2002 Annual Update for the HRR, which indicates that all data are below Tier II soil action levels The agencies agreed that these areas are not the location of ash pits, and therefore are not PACs, and they have been removed from the maps/plates in the HRR [The Ghost pits are shown on Figure 1 of this document for thoroughness] The regulatory agencies determined that additional data needed to be collected to render a NFA determination for the Incinerator Facility (SW-133 5) and the Concrete Wash Pad (SW-133 6)

Because of proposed modifications to RFCA Attachment 5, specifically, the introduction of new Action Levels (ALs) and the integrated risk-based approach (application of the Soil Risk Screen), Ash Pit 1 (SW-133 1), Ash Pit 2 (SW-133 2), Ash Pit 4 (SW-133 4), and the Recently Identified Ash Pit (TDEM-2) [SW-1702] have been reassessed to render a No Further Accelerated Action (NFAA) determination No additional data has been included in the reassessment of these PACs relative to that included in the 2001 Annual Update for the HRR RFCA Action levels (ALs) are from the proposed modifications to RFCA Attachment 5, dated November 12, 2002 (DOE, 2002) Background levels for subsurface soil and groundwater (total concentrations for Upper Hydrostratigraphic Unit) are from the Background Geochemical Characterization Report (DOE 1993a) Background values for surface soils and sediments are from Geochemical Characterization of Background Surface Soils Background Soils Characterization Program (DOE 1995) All background values used for comparison are the mean background value plus two standard deviations Table 1 lists the trenches and associated boreholes and/or wells

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SURFACE SOIL ASSESSMENT

Results from analysis of 18 surface soil and sediment samples from across the ash pit area indicate, with the exception of arsenic and beryllium, the metals are not at concentrations exceeding the 1996 Tier II Action Levels Of the arsenic and beryllium results, only one sample (a sediment sample) had a concentration exceeding background (arsenic at 17 3 mg/kg (bkg – 13 1 mg/kg)) , This one exceedance above background is below the wildlife refuge worker-based AL of 21 6 mg/kg In addition to laboratory analysis for radionuclides, a High Purity Germanium (HPGe) survey of the entire area was conducted in 1993 Figures 2, 3 and 4 show the survey results for americium-241, uranium-235, and uranium-238 Americium was not detected at statistically significant levels This result suggests the absence of plutonium Concentrations of the uranium isotopes were all well below the ALs Consequently, the excavation of surface soil is not required

APPLICATION OF THE SOIL RISK SCREEN FOR SUBSURFACE SOIL

Screen 1 – Are Contaminant of Concern (COC) Concentrations Below Table 3 Wildlife Refuge Worker (WRW) Soil Action Levels?

No As shown in Tables 2 through 5 and Figures 4a through 4d, concentrations of uranium isotopes and a few metals in pit material buried to a depth of approximately 3 feet exceed the ALs as follows

SW-133 1 –Uranium-235 and Uranium-238 (Table 2)

SW-133 2 – Chromium, Uranium-235 and Uranium-238 (Table 3)

SW-133.4 –Uranium-235 and Uranium-238 (Table 4)

SW-1702 - Chromium, Lead, and all of the Uranium isotopes (Table 5)

Screen 2 – Is there potential for subsurface soil to become surface soil?

Yes As shown in Figure 5, the ash pits are located in an area that was mapped as being prone to landslides

Evaluate accelerated action in accordance with Section 4 C and 5 C and consider any subsequent screens in the evaluation, as appropriate

As noted in Screen 1, the maximum concentrations of uranium isotopes and a few metals exceed the ALs at the Ash Pits However, with the exception of PACs SW-133 2 and SW-1702, the average concentrations are well below the ALs At SW-133 2, the average chromium concentration (429 7 mg/kg) exceeds the AL of 268 mg/kg However, the

average concentration is 1/20th of the maximum concentration indicating the maximum chromium concentration is an isolated zone of contamination not representative of the balance of the material present in the PAC At SW-1702, the average concentration of lead (1223 mg/kg) and uranium-235 (9 7 pCi/g) exceed their respective ALs (1000 mg/kg and 8 pCi/g) However, these exceedances are relatively small, i e , they are within 20 - 25% of the ALs

Although the Ash Pits are located in an area that has been mapped as a landslide deposit, a visual inspection of the area indicates it has a broad, gently sloping (~8% grade) surface, with no evidence of recent landslide activity Also, the area has a well-established vegetative cover, which will minimize erosion from runoff

Because the Ash Pits are near Woman Creek, bank erosion and eventual down-cutting into the Ash Pits is another potential mechanism to expose contaminated subsurface soil However, the closest Ash Pit, SW-133 6 [not under evaluation here], is 80 – 100 ft from the creek Over the past 60 years, there is no discernable bank erosion based on overlaying a relatively recent aerial photo transparency (ca 1992) on a 1937 aerial photo with the same scale Furthermore, the Ash Pits are outside the 100 year floodplain (Figure 6)

One final mechanism to be addressed with respect to potential exposure of subsurface contaminated soil is the action of burrowing animals Typically, prairie dogs burrow to depths of approximately 6 feet and thus potentially bring contaminated subsurface soil to the surface However, it must be recognized that the Ash Pits area is relatively small (~20 acres) compared to the human exposure unit sizes being considered for the comprehensive risk assessment (on the order of several hundred acres) Accordingly, the incremental impact from this activity is small Furthermore, any soil that would be brought to the surface would be mixed with uncontaminated overlying soil during the burrowing activity

Screen 3 – Does subsurface soil radiological contamination exceed criteria in Section 5.3 and Attachment 14?

No As shown in Tables 2 through 5, plutonium and americium concentrations are well below the soil ALs of 50 and 76 pCi/g respectively, and therefore, further analysis is not required

Some uranium isotopes, as noted in Screen 1, exceed soil ALs, however, approximately three feet of uncontaminated to slightly contaminated soils were previously placed over the pit materials This cover sufficiently protects the wildlife refuge worker from direct exposure and eliminates the need for an accelerated action

Screen 4 – Is there an environmental pathway and sufficient quantity of COC that would cause exceedance of surface water standards (SWS)?

No Although a groundwater treatment system is not and will not be in place to intercept groundwater from the Ash Pits, groundwater does not appear to be a significant pathway for COC migration to surface water Current groundwater monitoring does not indicate

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groundwater contamination in this area, however, the number and location of groundwater wells will be evaluated between now and Site closure

Contaminant migration via erosion and groundwater are the two possible pathways whereby surface water could become contaminated by the Ash Pits The erosion pathway can be eliminated because surface soil is largely uncontaminated in the vicinity of the Ash Pits (see Surface Soil Assessment), and deep erosion is unlikely as discussed in the evaluation presented in Screen 2 However, because groundwater is a possible pathway whereby Woman Creek could become contaminated by the Ash Pits, groundwater chemistry has been evaluated for evidence of contamination Subsequently, Woman Creek surface water quality is assessed

Downgradient Groundwater Quality

Data from wells in the vicinity of the Ash Pits were evaluated to determine whether there is an impact to groundwater Groundwater quality data are summarized in Table 6, and are discussed with respect to each of the PACs below

SW-133 1 (and SW-133 3) - One well, 56294, is immediately downgradient of these PACs No contaminants were detected above RFCA Tier I ALs and only thallium (5 9 ug/l) was found above the Tier II AL (2 ug/l) However, the thallium concentration exceeds background (5 19 ug/l) by a small percentage Furthermore, thallium is not a soil contaminant at SW-133 1 (Table 2) It is also not a contaminant at SW-133 3 (see 2001 Annual Update for the HRR)

SW-133 2 – Downgradient of this PAC aluminum concentrations in groundwater were greater than the RFCA Tier II AL in well 58793 (range 44,900 - 64,200 ug/l), thallium was reported once at a concentration greater than the RFCA Tier II AL in well 63793 (4 3 ug/l), and uranium-233,234 and uranium-238 concentrations (all less than 5 pCi/l) were greater than RFCA Tier II ALs in wells 58793, 63693, and 63793 downgradient of this PAC Although the aluminum concentration exceeded background (11,240 ug/l), thallium did not exceed background (5 19 ug/l) Also, aluminum and thallium are not soil contaminants at PAC 133 2 (Table 3) With respect to the uranium isotopes, although the concentrations exceed the Tier II ALs, they are well below background (uranium-233,234 [93 pCi/l], uranium-238 [66 pCi/l]) Furthermore, although uranium-233/234 and uranium-238 have maximum soil concentrations that are well above background, the average concentrations are more than an order of magnitude less, i e , the significant uranium contamination in the subsurface soil is isolated, and therefore, the PAC does not appear to be a significant source for groundwater uranium contamination

SW-133.4 and SW-1702 - The nearest downgradient well (63093) contained methylene chloride concentrations above detection limit and uranium-233/234 and uranium-238 concentrations above Tier II ALs This well was sampled numerous times, and methylene chloride was only detected once Additionally, methylene chloride is unlikely to be present in incinerator ash Like SW-133 2, the uranium isotopes are at concentrations well below background Also, although the maximum concentrations for all three uranium isotopes are

well above background in subsurface soil at PAC SW-133 4 (Table 4) and SW-1702 (Table 5), the average concentrations are approximately an order of magnitude less Again, the significant uranium contamination in the subsurface soil at these PACs is isolated, and therefore, the PACs do not appear to be significant sources for groundwater uranium contamination

More recent data was collected for well 63093 and well 5686 directly downgradient in the Woman Creek drainage (Table 7) The new uranium data for well 63093 indicates similar uranium concentrations to that of previous data The concentrations of these uranium isotopes further downgradient in the drainage (5686) are lower and below Tier II ALs

Downgradient Surface Water Quality

As shown in Table 8, aluminum, antimony, cadmium, copper, iron, lead, manganese, mercury, silver, americium-241, gross alpha, gross beta, and plutonium- 239/240 concentrations in nearby surface water locations have occurred at concentrations exceeding the surface water ALs However, the previous analysis regarding surface soil, subsurface soil, and groundwater contamination strongly suggests that the Ash Pits are not a source for metal and radionuclide contamination in surface water Furthermore, water quality data at downgradient station SW027 (surface water point of evaluation [POE]) and at Pond C-2, indicate these contaminants have never been detected above RFCA surface water ALs

Screen 5 – Are COC concentrations above Table 3 Action Levels for ecological receptors?

At this time, ecological ALs are not available for all receptors/chemical combinations, however, draft ALs are available for a small subset of chemicals Screen 5 currently evaluates only this subset Risk to ecological receptors will be readdressed through the ecological risk assessment portion of the Comprehensive Risk Assessment (CRA)

As shown below, maximum concentrations for beryllium and lead exceed the ecological ALs in all of the Ash Pits, and in most cases, the average concentrations also exceed the ALs as well as background The highest concentrations of lead and beryllium are observed in PAC 1702 where the average concentrations exceed the ALs by more than an order of magnitude (Table 5)

PAC	COC	Max. Conc. Exceeds Ecological AL?	Avg. Conc. Exceeds Ecological AL?	Avg. Conc. Exceeds Background ?
SW-133 1	Beryllium	Yes	No	No
SW-133 1	Lead	Yes	Yes	Yes
SW-133 2	Beryllium	Yes	Yes	Yes
SW-133 2	Lead	Yes	Yes	Yes
SW-133 4	Beryllium	Yes	No	No
SW-133 4	Lead	Yes	Yes	Yes

SW-1702	Beryllium	Yes	Yes	Yes
SW-1702	Lead	Yes	Yes	Yes

Evaluate accelerated action in accordance with Section 4 2 C and 5 3 I and consider any subsequent screens in the evaluation, as appropriate

Per Section 4 2 C of Attachment 5, DOE will consider the target species and the exposure unit for that species, and the location, areal extent, and concentration of contamination in evaluating and determining appropriate accelerated actions necessary to protect ecological resources

SW-1702 material contains average lead and beryllium concentrations that significantly exceed the ecological ALs As a first step in evaluating the risk posed to the ecological receptors, the ecological receptor that is the basis for the AL was identified

Beryllium
The beryllium AL of 2 15 mg/kg is based on protection of the prairie dog[1]

Lead
The lead AL of 25 6 mg/kg is based on protection of the American Kestrel Because the American Kestrel, a bird of prey would not be directly exposed to the buried material, Preliminary Remediation Goals (PRGs) for other ecological receptors were examined[2] The PRGs for protection of the prairie dog and Preble's Meadow Jumping Mouse (PMJM) are 149 mg/kg and 642 mg/kg, respectively

As can be seen from Tables 2 through 5, SW-1702 has significantly higher concentrations of beryllium and lead than the other Ash Pits, and the average concentrations exceed the AL/PRG for burrowing animals (the PMJM-based PRG for beryllium is 8 71 mg/kg) Although the concentrations of these COCs exceed the PRGs for protection of the PMJM, the mouse typically burrows to a depth of only 15 inches, and the buried material is 3 feet below ground surface at the Ash Pits per the Historical Release Report (DOE 1992) Therefore, it is unlikely that the PMJM will be exposed to the material Furthermore, the areal extent of SW-1702 is relatively small compared to the habitat areas on Site, and accordingly, the risk to the PMJM (and prairie dog) is also proportionately low Lastly, SW-1702 is in a PMJM habitat, and it is uncertain that removal of the buried material and disruption of the habitat would result in a net benefit to the PMJM

[1] It should be noted that the background beryllium concentration for subsurface soil is 14 2 mg/kg which exceeds the AL In this case and in all cases where background levels exceed the AL for protection of ecological receptors, achieving background levels becomes the cleanup goal

[2] The AL is the lowest PRG above Site background levels that was calculated for each of the five selected wildlife receptors judged to be representative of species at RFETS Preble's meadow jumping mouse and black tailed prairie dog (fossorial [burrowing] small mammals), mourning dove (small ground-feeding bird), terrestrial invertebrate (multiple species), and American kestrel (avian predator) See also footnote 1

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Stewardship Analysis

Application of the Soil Risk Screen to the Ash Pits, specifically Ash Pit 1 (SW-133 1), Ash Pit 2 (SW-133 2), Ash Pit 4 (SW-133 4), and the Recently Identified Ash Pit (TDEM-2) [SW-1702], indicates No Further Accelerated Action (NFAA) is necessary for protection of public health and environment However, because subsurface soil at some of these PACs has contaminant concentrations that exceed soil ALs, both near-term and long-term stewardship actions have been recommended[3] They are discussed below

Near-Term Management Recommendations

Near-term recommendations for environmental stewardship include the following

- Continued groundwater monitoring to evaluate potential impacts to surface water quality,
- Excavation at the area will continue to be controlled through the Site Soil Disturbance Permit process, and
- Site access and security controls will remain in place pending implementation of long-term controls

Long-Term Stewardship Recommendations

Based on remaining environmental conditions at the Ash Pits, no specific long-term stewardship activities are recommended beyond the generally applicable Site requirements that may be imposed on this area in the future, which are dependent upon the final remedy selected Institutional controls that may be used as appropriate for this area include the following

- Prohibitions on construction of buildings,
- Restrictions on excavation or other soil disturbance,
- Prohibitions on groundwater pumping in the area of the Ash Pits, and
- Monitoring for or prevention of intrusion by burrowing animals

It is also proposed that the groundwater monitoring network in the vicinity of the Ash Pits be evaluated between now and Site closure to determine its adequacy in detecting releases from the Ash Pits A new well(s) will be added if appropriate Furthermore, a marker will be placed near the southwestern corner of the western most Ash Pit to monitor bank erosion, if any, that may occur These specific long-term stewardship recommendations will also be summarized in the Rocky Flats *Long Term Stewardship Strategy* No engineered controls, other environmental monitoring, or physical controls (e g , fences) are recommended as a result of the conditions remaining at the Ash Pits

[3] The Ash Pits are contiguous with the Industrial Area (IA) where subsurface soil contaminant concentrations will likely exceed soil ALs at some locations Considering the large size of the IA relative to the Ash Pits, there would be no significant reduction in the area requiring near-term and long-term stewardship actions if the contaminated subsurface soil at the Ash Pits were removed

The Ash Pits will be evaluated as part of the Sitewide Comprehensive Risk Assessment, which is part of the RCRA Facility Investigation/Remedial Investigation (RFI/RI) and Corrective Measures Study/Feasibility Study (CMS/FS) that will be conducted for the Site The need for and extent of any, more general, long-term stewardship activities will also be analyzed in RFI/RI and CMS/FS and will be proposed as part of the preferred alternative in the Proposed Plan for the Site Institutional controls and other long-term stewardship requirements for Rocky Flats will ultimately be contained in the Corrective Action Decision/Record of Decision, in any post-closure Colorado Hazardous Waste Act permit that may be required, and in any post-RFCA agreement

NFAA Summary

Ash Pit 1 (SW-133 1), Ash Pit 2 (SW-133 2), Ash Pit 4 (SW-133 4), and the Recently Identified Ash Pit (TDEM-2) [SW-1702] are proposed for NFAA The Soil Risk Screen and soil ALs proposed in the RFCA Attachment 5 Modification dated 11/12/02 have been applied to these PACs The risk screen shows an insignificant potential adverse risk to a wildlife refuge worker because the waste is buried, and the Ash Pits area, although located in a landslide deposit, is in a stable configuration having a gently slope, and a well established vegetative cover to minimize erosion It is possible a burrowing animal may bring contaminated soil to the surface, however, the incremental risk to the wildlife refuge worker is small because the Ash Pits area is relatively small compared to the exposure unit size for the worker Although concentrations of lead and beryllium exceed the Preble's Meadow Jumping Mouse (and prairie dog) PRGs, particularly in PAC 1702, the mouse typically burrows to a depth of only 15 inches, and there is 3 feet of soil cover on the Ash Pit Furthermore, the volume of waste and areal extent of PAC 1702 is relatively small, and accordingly, the risk to the Preble's Meadow Jumping Mouse is also proportionately low There is little potential for contaminated runoff to impact surface water quality because the waste is buried and covered, the Ash Pits are located far enough from Woman Creek that it is unlikely that bank erosion would impact the Ash Pits, and they are located outside the 100 year flood plain Examination of groundwater quality indicates a potential for low level uranium contamination that may have arisen from the Ash Pits, but no impacts from other contaminants However, uranium is not a contaminant that exceeds surface water ALs in Woman Creek, and therefore, there is no apparent impact to surface water quality from the Ash Pits Application of the Soil Risk Screen indicates no further accelerated action is required

References

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DOE 1993a, *Background Geochemical Characterization Report,* Golden, CO, September

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EPA, CDPHE, 2002 Correspondence to J Legare, DOE RFO, from T Rehder, EPA Region VIII, S Gunderson, CDPHE, RE *Approval of NFA Designation for IHSSs & PACs*, February 14, 2002

Table 1-.Subsurface Soil Sampling Locations for Ash Pits

IHSS/PAC Number	Borehole Locations
133 1	56293, 56393, 56493, 58893
133 2	56893, 56993, 57093, 57294
133 4	55694, 55893, 55993, 56093
SW-1702	55894, 55994, 56094

Table 2 - Summary of Analytical Results for Subsurface Soil at SW-133 1

Analyte*	Samples Above Detection Limit	Maximum Concentration	Unit	Average Concentration	Action Level	Background Concentration
Aluminum	11	24300	mg/kg	9820 9	228000	35373 2
Americium 241	1	1	pCi/g	1	76/1,900**	0 02
Antimony	2	33	mg/kg	26 5	409	17 0
Arsenic	11	14	mg/kg	3 5	22 2/21 6**	13 1
Barium	11	374	mg/kg	159 7	26400	289 4
Beryllium	7	4	mg/kg	1 4	921/2 15**	14 2
Cadmium	3	57	mg/kg	20 7	962	1 7
Calcium	11	24600	mg/kg	7166 4		39382 3
Cesium	1	13	mg/kg	13 0		
Chromium	11	41	mg/kg	11 5	268	68 3
Cobalt	11	37	mg/kg	11 0	1550	29 0
Copper	11	2920	mg/kg	298 6	40900	38 2
Gross Alpha	12	742	pCi/g	78 9		43 5
Gross Beta	12	1580	pCi/g	171 0		36 8
Iron	11	31100	mg/kg	13932 7	307000	41046 5
Lead	11	260	mg/kg	52 2	1000/25 6**	25 0
Lithium	11	8	mg/kg	5 0	20400	34 7
Magnesium	11	4670	mg/kg	2595 5		9315 4
Manganese	11	696	mg/kg	228 5	3480	901 6
Molybdenum	1	24	mg/kg	24 0	5110	25 6
Nickel	10	66	mg/kg	21 3	20400	62 2
Plutonium 239/240	1	1	pCi/g	1	50	0 02
Potassium	11	1680	mg/kg	986 5		6196 8
Silver	3	158	mg/kg	57 3	5110	24 5
Sodium	11	741	mg/kg	394 7		1251 2
Strontium	11	96	mg/kg	52 7	613000	211 4
Thallium	1	1	mg/kg	1		1 8
Tin	1	16	mg/kg	16 0	613000	286 3
Uranium 234	13	127	pCi/g	20 8	300/1,800**	2 6
Uranium 235	11	20	pCi/g	2 0	8/1,900**	0 12
Uranium 238	13	1210	pCi/g	192 3	351/1,600**	1 5
Vanadium	11	58	mg/kg	24 4	7150/433**	88 49
Zinc	11	891	mg/kg	136 4	307000	139 1

Max Conc Above Background

Max Conc Above Action Level

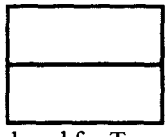
* Subsurface soil samples were analyzed for Target Analyte List (TAL) metals gross alpha and beta uranium 233 234 uranium 235 uranium 238 americium 241 and plutonium 239 240 Analytes shown are only those that were detected The average concentrations are computed from the detected values only

**AL for protection of wildlife refuge worker/AL for protection of ecological receptor

Table 3 - Summary of Analytical Results for Subsurface Soils at SW-133 2

	Number of Samples Above Detection Limit	Maximum	Units	Average	Action Level	Background
Aluminum	20	17400	mg/kg	11396 33	228000	35373 17
Americium 241	19	1 169	pCi/g	0 114233474	76	0 02
Antimony	3	149	mg/kg	55 23333333	409	16 97
Arsenic	20	24 3	mg/kg	4 59	22 2	13 14
Barium	20	414	mg/kg	164 3	26400	289 38
Beryllium	11	131	mg/kg	22 43636364	921	14 20
Cadmium	7	64 8	mg/kg	18 27142857	962	1 70
Chromium	20	8310	mg/kg	436 06	268	68 27
Cobalt	20	67 6	mg/kg	11 895	1550	29 04
Copper	20	1394 3	mg/kg	177 22	40900	38 21
Gross Alpha	20	274	pCi/g	41 37735		43 47
Gross Beta	20	662 5	pCi/g	72 779		36 84
Iron	19	62263 7	mg/kg	19288 61579	307000	41046 52
Lead	14	925	mg/kg	80 89285714	1000	24 97
Lithium	16	14 1	mg/kg	7 74375	20400	34 66
Magnesium	20	4450	mg/kg	2716 315		9315 44
Manganese	20	1260	mg/kg	271 965	3480	901 62
Mercury	4	0 13	mg/kg	0 0875	25200	1 52
Molybdenum	5	470	mg/kg	123 88	5110	25 61
Nickel	20	4750	mg/kg	263 123	20400	62 21
Plutonium 239/240	19	0 9389	pCi/g	0 130267153	50	0 02
Potassium	18	2290	mg/kg	1549 722222		6196 81
Selenium	2	80 8	mg/kg	40 835	5110	4 80
Silver	6	190	mg/kg	58 95	5110	24 54
Sodium	17	1200	mg/kg	283 2529412		1251 24
Strontium	20	54 1	mg/kg	27 945	613000	211 38
Thallium	11	0 39	mg/kg	0 288181818		1 84
Tin	2	36 1	mg/kg	30 25	613000	286 31
Uranium 234	19	105 7	pCi/g	9 296484211	300	2 64
Uranium 235+D	19	37 68	pCi/g	2 154533684	8	0 12
Uranium 238+D	19	1160	pCi/g	66 49149474	351	1 49
Vanadium	20	61 3	mg/kg	35 06	7150	88 49
Zinc	20	1428 3	mg/kg	240 015	307000	139 10
1 2 4 Trichlorobenzene	1	60	ug/kg	60	9230000	
1 2 Dichlorobenzene	1	30	ug/kg	30	31200000	
1 4 Dichlorobenzene	1	10	ug/kg	10	840000	
2 Chlorophenol	1	10	ug/kg	10	5110000	
2 Methylnaphthalene	1	10	ug/kg	10	20400000	
Benzo(a)pyrene	1	10	ug/kg	10	3490	

bis(2 Ethylhexyl)phthalate	1	80	ug/kg	80	1970000	
Butylbenzylphthalate	1	50	ug/kg	50	147000000	
Dibenzofuran	1	10	ug/kg	10	2950000	
Diethyl phthalate	1	40	ug/kg	40	590000000	
Di n butylphthalate	1	2700	ug/kg	2700	73700000	
Fluoranthene	1	10	ug/kg	10	27200000	
Hexachlorobenzene	1	30	ug/kg	30	17200	
Naphthalene	1	30	ug/kg	30	3090000	
Phenol	1	30	ug/kg	30	613000000	
Pyrene	1	10	ug/kg	10	22100000	



Max Conc Above Background

Max Conc Above Action Level

* Subsurface soil samples were analyzed for Target Analyte List (TAL) metals gross alpha and beta uranium 233 234 uranium 235 uranium 238 americium 241 and plutonium 239 240 Analytes shown are only those that were detected The average concentrations are computed from the detected values only
**AL for protection of wildlife refuge worker/AL for protection of ecological receptor

Table 4 - Summary of Analytical Results for Subsurface Soils at SW-133 4

Analyte	Number of Samples above Detection Limit	Maximum Concentration	Unit	Average Concentration	Action Level	Background Concentration
Aluminum	11	21200	mg/kg	12253 6	228000	35373 2
Antimony	4	28	mg/kg	16 0	409	17 0
Arsenic	11	8	mg/kg	3 9	22 2/21 6**	13 1
Barium	11	637	mg/kg	199 9	26400	289 4
Beryllium	7	4	mg/kg	2 1	921/2 15**	14 2
Cadmium	6	42	mg/kg	18 3	962	1 7
Calcium	11	15100	mg/kg	6572 7		39382 3
Cesium	1	17	mg/kg	17 0		
Chromium	11	62	mg/kg	22 6	268	68 3
Cobalt	11	34	mg/kg	11 5	1550	29 0
Copper	11	2520	mg/kg	609 5	40900	38 2
Gross Alpha	12	363	pCi/g	109 6		43 5
Gross Beta	12	606	pCi/g	172 6		36 8
Iron	11	107000	mg/kg	29549 1	307000	41046 5
Lead	11	935	mg/kg	149 2	1000/25 6**	25 0
Lithium	5	18	mg/kg	11 0	20400	34 7
Magnesium	11	5190	mg/kg	3228 2		9315 4
Manganese	11	998	mg/kg	326 7	3480	901 6
Mercury	1	1	mg/kg	1	25200	1 5
Molybdenum	4	20	mg/kg	13 5	5110	25 6
Nickel	11	93	mg/kg	32 7	20400	62 2
Plutonium 239/240	1	1	pCi/g	1	50	0 02
Potassium	8	2280	mg/kg	1416 1		6196 8
Silicon	3	368	mg/kg	316 0		
Silver	6	311	mg/g	81 7	5110	24 5
Sodium	10	1220	mg/kg	648 2		1251 2
Strontium	11	72	mg/kg	42 7	613000	211 4
Tin	4	579	mg/kg	168 0	613000	286 3
Uranium 234	10	241	pCi/g	50 5	300/1,800**	2 6
Uranium 235	10	17	pCi/g	4 5	8/1,900**	0 12
Uranium 238	10	848	pCi/g	150 1	351/1,600**	1 5
Vanadium	11	60	mg/kg	33 0	7150/433**	88 5
Zinc	11	2390	mg/kg	531 2	307000	139 1

Max Conc Above Background

Max conc Above Action Level

* Subsurface soil samples were analyzed for Target Analyte List (TAL) metals gross alpha and beta uranium 233 234 uranium 235 uranium 238 americium 241 and plutonium 239 240 Analytes shown are only those that were detected The average concentrations are computed from the detected values only

**AL for protection of wildlife refuge worker/AL for protection of ecological receptor

Table 5 - Summary of Analytical Results for Subsurface Soils at SW-1702

Analyte	Number of Samples above Detection Limit	Maximum Concentration	Unit	Average Concentration	Action Level	Background Concentration
Aluminum	9	28600	mg/kg	17514 4	228000	35373 1
Americium 241	1	3	pCi/g	3	76/1,900**	0 02
Antimony	2	16	mg/kg	11 5	409	17 0
Arsenic	9	21	mg/kg	10 0	22 2/21 6**	13 1
Barium	9	1680	mg/kg	509 7	26400	289 4
Beryllium	9	446	mg/kg	91 4	921/2 15**	14 2
Cadmium	7	71	mg/kg	27 0	962	1 7
Calcium	9	24700	mg/kg	8977 8		39382 3
Cesium	6	9	mg/kg	6 2		
Chromium	9	434	mg/kg	99 6	268	68 3
Cobalt	9	701	mg/kg	148 6	1550	29 0
Copper	9	8850	mg/kg	2081 4	40900	38 2
Gross Alpha	11	418	pCi/g	116 4		43 5
Gross Beta	11	899	pCi/g	276 5		36 8
Iron	9	106000	mg/kg	40500 0	307000	41046 5
Lead	9	5200	mg/kg	1223 4	1000/25 6**	25 0
Lithium	9	14	mg/kg	10 6	20400	34 7
Magnesium	9	11700	mg/kg	4656 7		9315 4
Manganese	9	2150	mg/kg	588 6	3480	901 6
Molybdenum	5	68	mg/kg	34 4	5110	25 6
Nickel	9	325	mg/kg	94 1	20400	62 2
Plutonium 239/240	4	7	pCi/g	3 5	50	0 02
Potassium	9	3950	mg/kg	1734 0		6196 8
Selenium	3	7	mg/kg	5 3	5110	4 8
Silicon	3	704	mg/kg	503 0		
Silver	8	209	mg/kg	74 5	5110	24 5
Sodium	9	3360	mg/kg	1254 1		1251 2
Strontium	9	102	mg/kg	54 1	613000	211 4
Thallium	5	7	mg/kg	3 4		1 8
Tin	7	102	mg/kg	49 6	613000	286 3
Uranium 234	11	350	pCi/g	63 8	300/1,800**	2 6
Uranium 235	11	68	pCi/g	9 7	8/1,900**	0 12
Uranium 238	11	940	pCi/g	177 0	351/1,600**	1 5
Vanadium	9	60	mg/kg	36 2	7150/433**	88 5
Zinc	9	7220	mg/kg	1802 6	30700	139 1

Max Conc Above Background

Max Conc Above Action Level

* Subsurface soil samples were analyzed for Target Analyte List (TAL) metals gross alpha and beta uranium 233 234 uranium 235 uranium 238 americium 241 and plutonium 239 240 Analytes shown are only those that were detected The average concentrations are computed from the detected values only

**AL for protection of wildlife refuge worker/AL for protection of ecological receptor

Table 6 - Summary of Analytical Results Above Tier II Action Levels for Groundwater at the Ash Pits

Location	Collection Date	Description	Result	Units	Above Tier I	Above Tier II	Tier I	Tier II
IHSSs 133.1 and 133.3								
56294	4/27/95	Thallium	5 9	ug/L	No	Yes	200	2
IHSS 133.2								
58793	3/7/95	Aluminum	44900 0	ug/L	No	Yes	3 65E+06	3 65E+04
58793	8/12/93	Aluminum	64200 0	ug/L	No	Yes	3 65E+06	3 65E+04
63793	5/1/95	Thallium	4 3	ug/L	No	Yes	200	2
63693	1/18/95	Uranium-233,-234	1 3	pCi/L	No	Yes	106	1 06
63793	1/4/95	Uranium-233,-234	1 4	pCi/L	No	Yes	106	1 06
63793	5/1/95	Uranium-233,-234	4 1	pCi/L	No	Yes	106	1 06
58793	8/12/93	Uranium-238	0 8	pCi/L	No	Yes	76 8	0 768
58793	6/18/93	Uranium-238	1 1	pCi/L	No	Yes	76 8	0 768
58793	1/6/95	Uranium-238	3 6	pCi/L	No	Yes	76 8	0 768
63693	1/18/95	Uranium-238	1 3	pCi/L	No	Yes	76 8	0 768
63793	1/4/95	Uranium-238	1 1	pCi/L	No	Yes	76 8	0 768
63793	5/1/95	Uranium-238	2 9	pCi/L	No	Yes	76 8	0 768
IHSS 133.4 and SWMU 07								
63093	3/30/94	Methylene Chloride	13 0	ug/L	No	Yes	500	5
63093	5/24/95	Uranium-233,-234	3 3	pCi/L	No	Yes	106	1 06
63093	5/24/95	Uranium-238	2 4	pCi/L	No	Yes	76 8	0 768

Table 7 - Uranium Concentrations in Groundwater Downgradient of SW-133 4 and SW-1702 (August 2001)

Analyte	Result	Unit	Minimum Detection Activity	Tier I Action Level	Tier II Action Level
Well 5686					
Uranium-233,-234	0 65	pCi/L	0 046	106	1 06
Uranium-235	U	pCi/L	0 060	135	24
Uranium-238	0 53	pCi/L	0 046	586	103
Well 63093					
Uranium-233,-234	2 58	pCi/L	0 068	106	1 06
Uranium- 235	0 093	pCi/L	0 048	135	24
Uranium-238	1 92	pCi/L	0 014	586	103

Table 8 – Analytes Detected Above Action Levels in Surface Water Near the Ash Pits

Location	Collection Date	Description	Result	Units	Standard
Metals					
SW041	8/6/90	Aluminum	90 6	ug/L	87
SW041	8/6/90	Aluminum	99 1	ug/L	87
SW039	4/12/90	Aluminum	238	ug/L	87
SW041	4/5/90	Aluminum	631	ug/L	87
SW040	7/30/87	Aluminum	2500	ug/L	87
SW041	9/5/90	Antimony	11 4	ug/L	6
SW039	11/8/90	Antimony	14 7	ug/L	6
SW039	9/13/90	Antimony	22 4	ug/L	6
SW041	7/8/91	Antimony	29	ug/L	6
SW039	9/13/90	Antimony	14 4	ug/L	6
SW039 -	11/8/90	Antimony	15 6	ug/L	6
SW041	6/4/91	Cadmium	1 9	ug/L	1 5
SW041	7/8/91	Cadmium	2	ug/L	1 5
SW039	6/4/91	Copper	16	ug/L	16
SW041	6/4/91	Copper	28	ug/L	16
SW041	8/5/91	Iron	1010	ug/L	1000
SW041	9/5/91	Iron	1100	ug/L	1000
SW041	4/5/90	Iron	1320	ug/L	1000
SW041	12/4/90	Iron	13900	ug/L	1000
SW041	12/4/90	Iron	13900	ug/L	1000
SW041	11/20/89	Iron	15900	ug/L	1000
SW041	2/6/90	Iron	1970	ug/L	1000
SW041	6/16/89	Iron	2090	ug/L	1000
SW041	5/3/91	Iron	2670	ug/L	1000
SW041	5/3/91	Iron	2670	ug/L	1000
SW041	2/6/90	Iron	3550	ug/L	1000
SW039	12/4/90	Iron	5390	ug/L	1000
SW039	12/4/90	Iron	5390	ug/L	1000
SW041	5/26/89	Iron	5480	ug/L	1000
SW041	6/4/90	Iron	6800	ug/L	1000
SW041	12/5/89	Iron	8180	ug/L	1000
SW039	11/18/91	Lead	8	ug/L	6 5
SW039	12/20/89	Lead	7 3	ug/L	6 5
SW041	12/5/89	Lead	6 6	ug/L	6 5
SW041	12/4/90	Manganese	1100	ug/L	1000
SW041	12/4/90	Manganese	1100	ug/L	1000

Table 8 - Analytes Detected Above Action Levels in Surface Water Near the Ash Pits (cont.)

Location	Collection Date	Description	Result	Units	Standard
SW039	11/17/89	Mercury	0 33	ug/L	0 01
SW041	5/26/89	Mercury	0 44	ug/L	0 01
SW039	4/6/89	Mercury	0 3	ug/L	0 01
SW041	3/1/89	Mercury	1 1	ug/L	0 01
SW039	3/21/90	Mercury	0 25	ug/L	0 01
SW039	4/12/90	Mercury	0 3	ug/L	0 01
SW039	11/17/89	Mercury	0 33	ug/L	0 01
SW039	4/15/92	Silver	2 7	ug/L	0 6
SW041	12/4/90	Silver	3 4	ug/L	0 6
SW041	12/4/90	Silver	3 4	ug/L	0 6
SW041	9/5/90	Silver	3 5	ug/L	0 6
SW041	11/5/90	Silver	9 8	ug/L	0 6
SW041	7/8/91	Silver	3	ug/L	0 6
SW041	11/5/90	Silver	9 8	ug/L	0 6
Radionuclides					
SW039	1/17/90	Americium-241	0 162	pCi/L	0 15
SW039	1/17/90	Americium-241	0 162	pCi/L	0 15
SW041	6/4/90	Gross Alpha	40 1	pCi/L	7
SW041	6/16/89	Gross Alpha	57	pCi/L	7
SW041	1/4/90	Gross Alpha	8 3	pCi/L	7
SW041	1/4/90	Gross Alpha	8 3	pCi/L	7
SW039	7/16/90	Gross Beta	23 69	pCi/L	8
SW041	1/4/90	Gross Beta	14 9	pCi/L	8
SW041	6/4/90	Gross Beta	36	pCi/L	8
SW041	6/16/89	Gross Beta	41	pCi/L	8
SW039	6/27/88	Plutonium-239/240	0 219	pCi/L	0 15

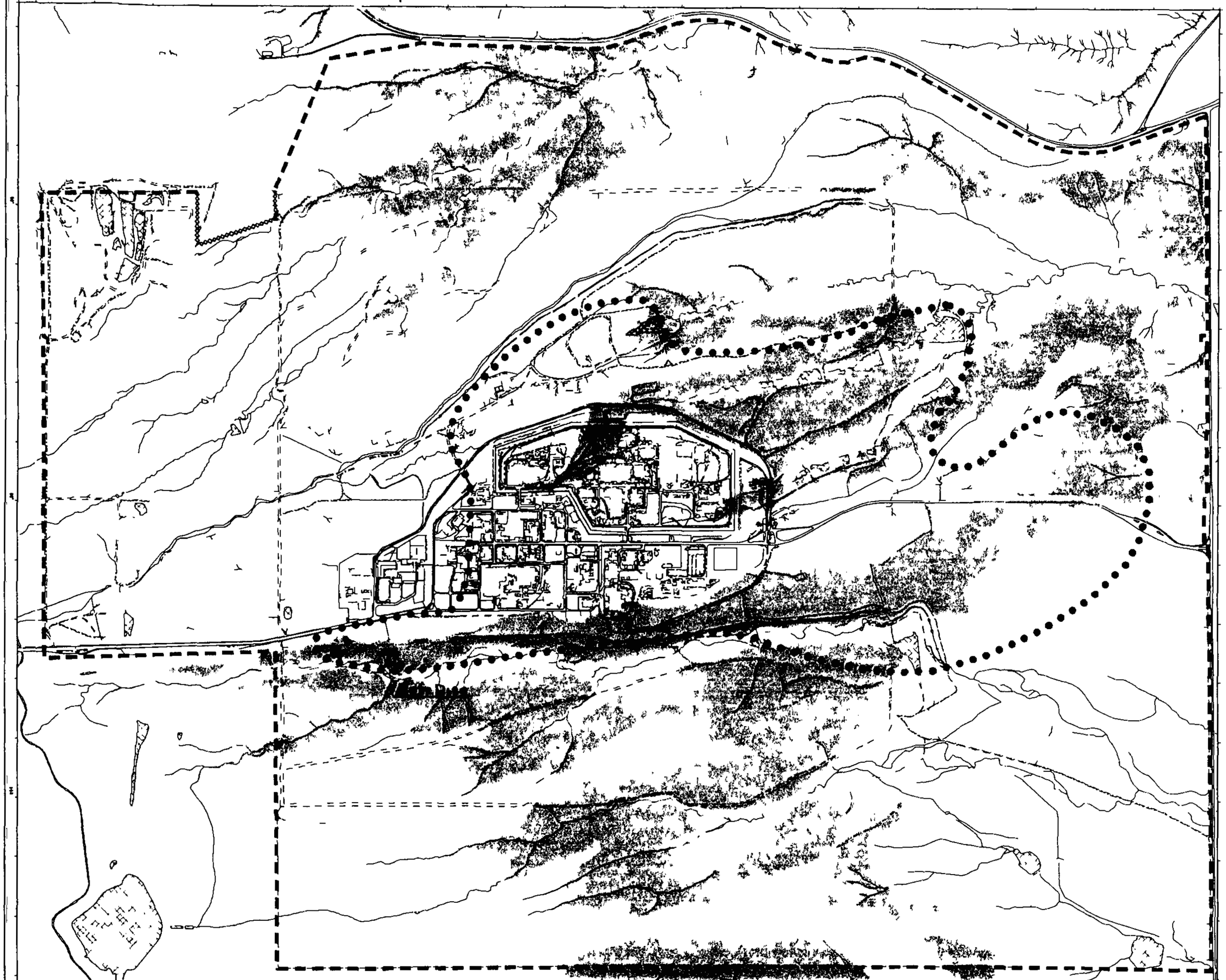


Figure 5

Area of Landslides and High Erosion Potential

EXPLANATION

- Areas of landslides and high erosion. Contaminated sites within these areas must be evaluated per Risk Screen 2 of Figure 3

The anticipated boundary of areas that will be subject to institutional controls is subject to modification based upon characterization, future response actions, the results of the comprehensive risk assessment, and the final remedial/corrective action decision in the final CAD/ROD. See Section 1.2

- Approximately 25 acres identified as proposed Wind Technology Expansion Area in Rocky Flats National Wildlife Refuge Act 2001

Standard Map Features

NOTES

29

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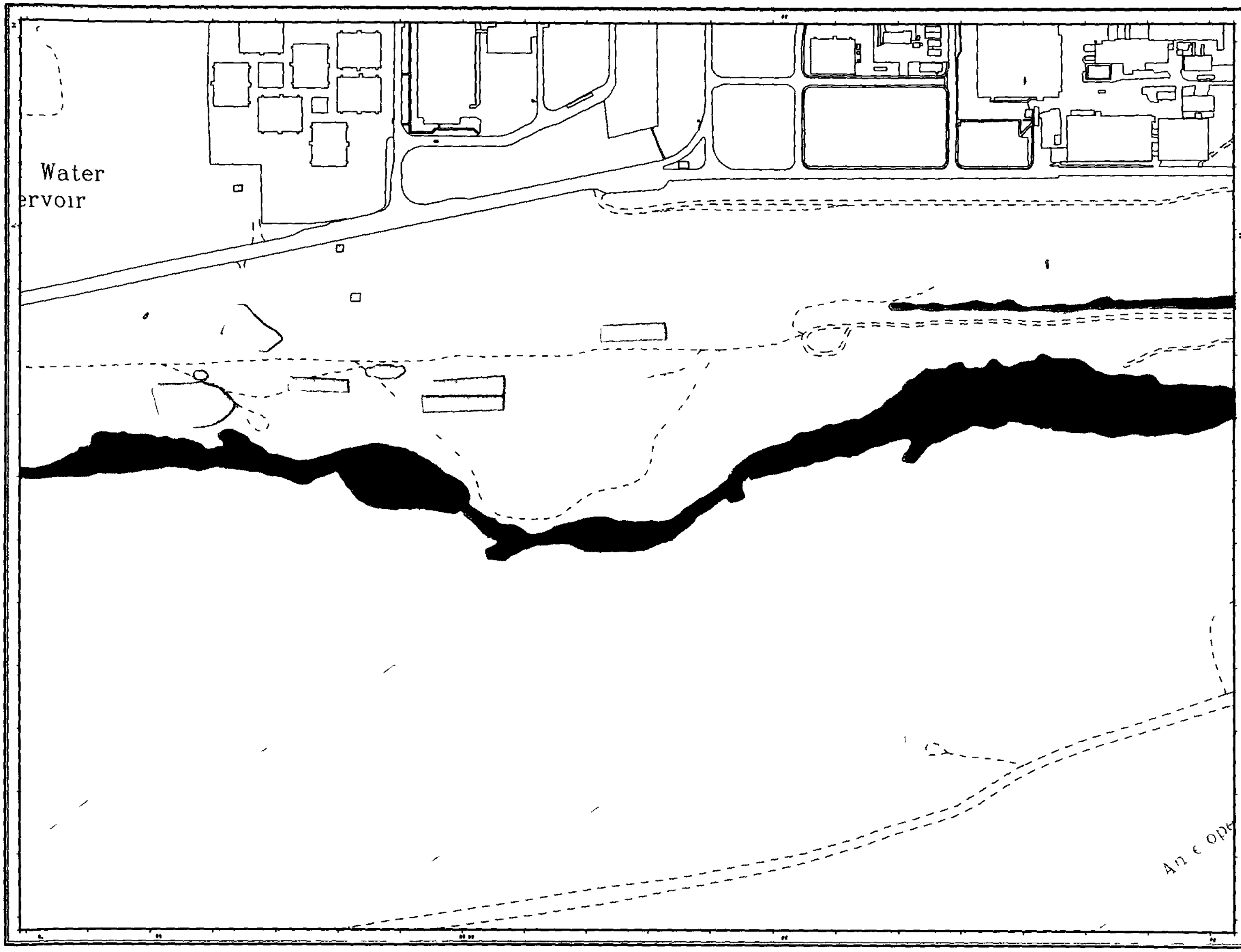

Figure 6
100 Year Flood Plain
ın the Ash Pits Area

EXPLANATION

- 100 Year Flood
- Ash Pits

Standard Map Features

- Buildings and other structures
- Demolished buildings and Other Structures
- Lakes and ponds
- Streams, ditches or other drainage features
- Fences and other barriers
- Topographic Contour (20 Foot)
- Rocky Flats Environmental Technology Site boundary
- Paved roads
- Dirt roads

DATA SOURCE BASE FEATURES
Buildings, fen es, hydrography, roads and other struct res from 1994 aerial fly over dat aptured by EG&G RSL, Las Vegas.
Digit zed from th orthophotographs. 1/95
Topographic cont urs were derived f om digital elevation model (DEM) dat by Morrison Knudson (MK) using ESRI A TIN and LATTICE t proces th DEM dat t create 5-foot contours. The DEM dat was aptured by he Remot Sensing Lab, Las Vegas, NV, 1994 Aerial Flyover at 10 meter esolution. DEM post processing performed by MK, Winter 1997

Sc le 1 3740
1 inch apr ee ppr ma ly 312 feet

St t Plane Coordina Projection
Colo do C nt l Z ne
D tum NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

GIS Dept. 303-966-7707

Prepar d by
CH2MHILL

Pr pared for
KAI ER HILL

April 15, 2003

Fi

Ash Pit

EXPL

- S b rf S
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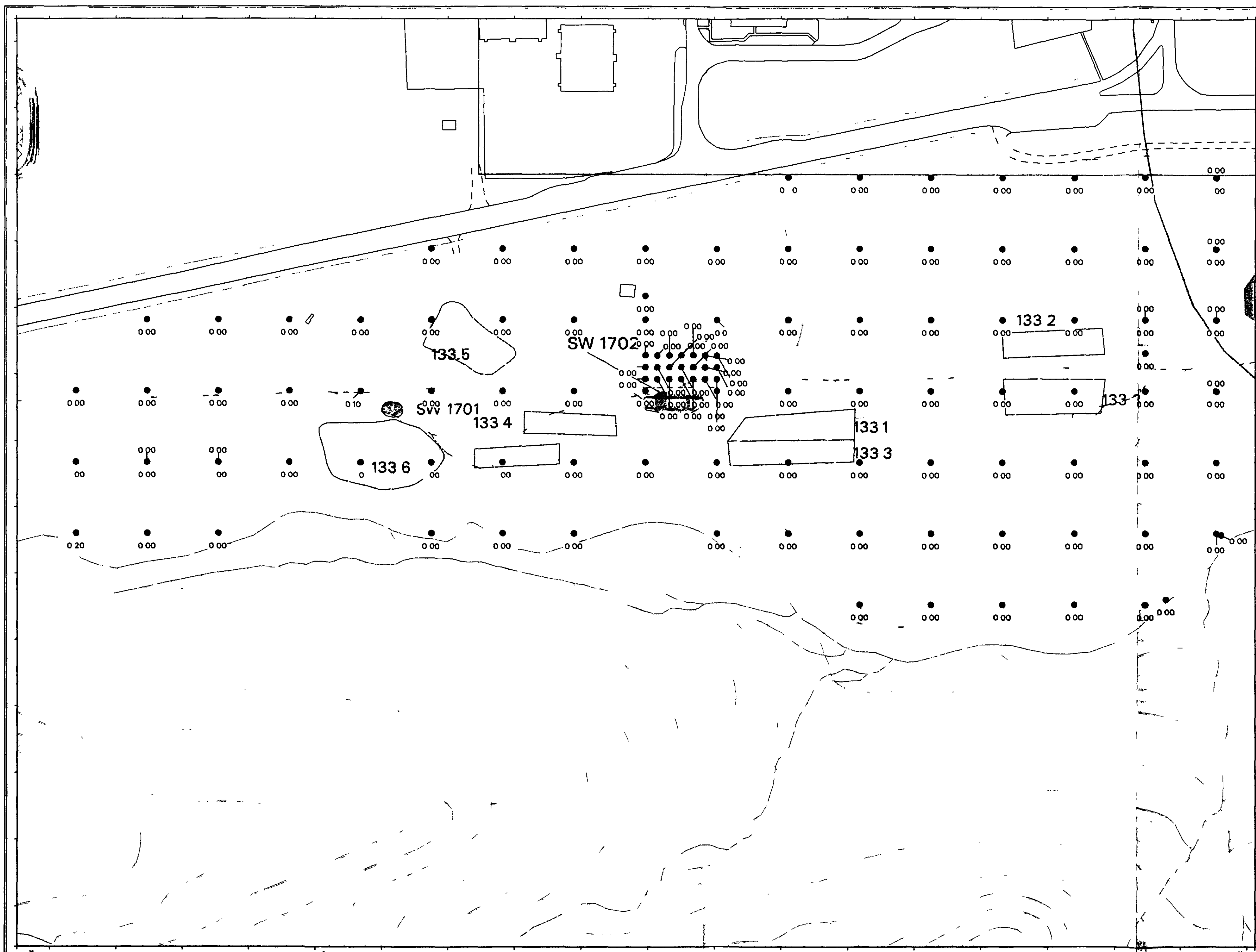

Figu

Ash
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EXPLAN

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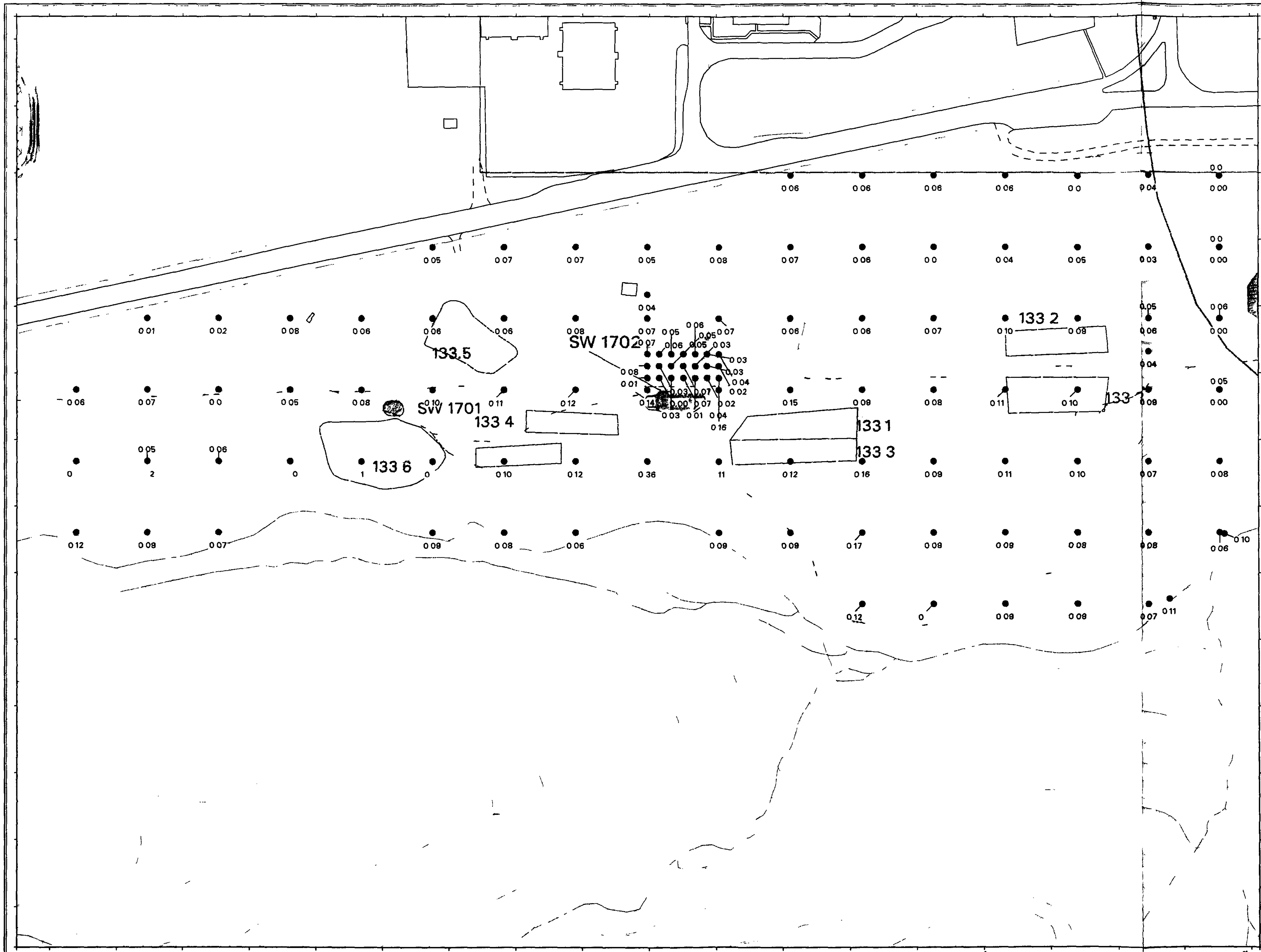

Figur

Ash
HPGe D
Uranium 2

EXPLAN

● HPG Lo t

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Prepa ed by

Figure 4

Ash Pits
HPGe Data for
Uranium 238 (pCi/g)

EXPLANATION

HPG Lo t

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Dept. 303-966-770

Prepared by:

Prepa ed

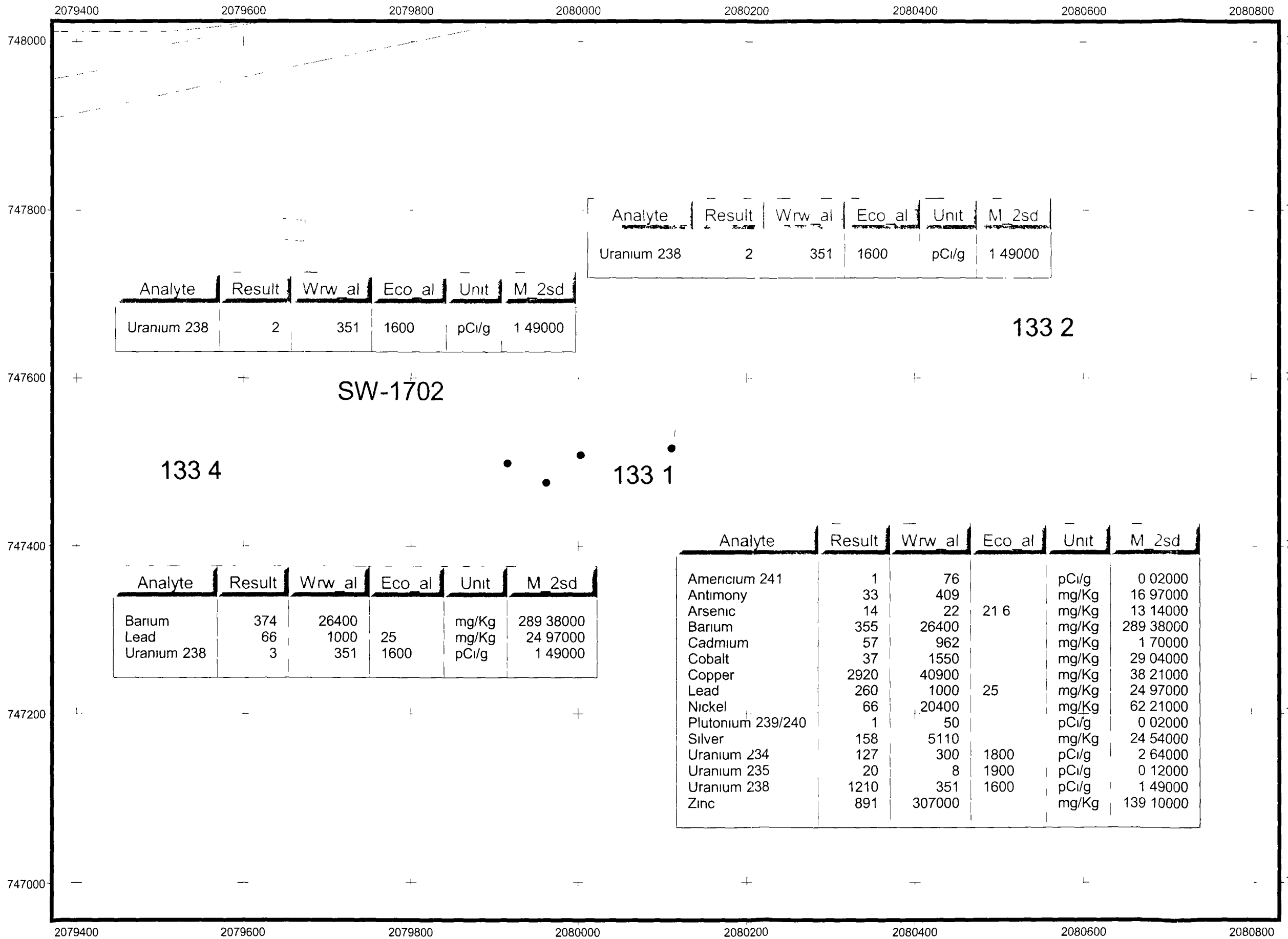
CH2M

Apri 09 2003

NTS /p /ty2 30 7 / h p p 2 h f

Figure 4a

IHSS 133 1
Subusurface Soil
Maximum Sampling Results
Greater than Background
Means Plus Two Standard
Deviations



Analyte	Result	Wrw_al	Eco_al	Unit	M_2sd
Uranium 238	2	351	1600	pCi/g	1 49000

Analyte	Result	Wrw_al	Eco_al	Unit	M_2sd
Uranium 238	2	351	1600	pCi/g	1 49000

Analyte	Result	Wrw_al	Eco_al	Unit	M_2sd
Barium	374	26400		mg/Kg	289 38000
Lead	66	1000	25	mg/Kg	24 97000
Uranium 238	3	351	1600	pCi/g	1 49000

Analyte	Result	Wrw_al	Eco_al	Unit	M_2sd
Americium 241	1	76		pCi/g	0 02000
Antimony	33	409		mg/Kg	16 97000
Arsenic	14	22	21 6	mg/Kg	13 14000
Barium	355	26400		mg/Kg	289 38000
Cadmium	57	962		mg/Kg	1 70000
Cobalt	37	1550		mg/Kg	29 04000
Copper	2920	40900		mg/Kg	38 21000
Lead	260	1000	25	mg/Kg	24 97000
Nickel	66	20400		mg/Kg	62 21000
Plutonium 239/240	1	50		pCi/g	0 02000
Silver	158	5110		mg/Kg	24 54000
Uranium 234	127	300	1800	pCi/g	2 64000
Uranium 235	20	8	1900	pCi/g	0 12000
Uranium 238	1210	351	1600	pCi/g	1 49000
Zinc	891	307000		mg/Kg	139 10000

KEY

- IHSS
- PAC 1702
- Paved area
- Dirt road
- Stream ditch or drainage
- Sampling location

N

30 0 30 60 Feet

Scale = 1 1 350

St t Pl C d t P j t
C l d C t lZ
D t m NAD 27

US D p rtm t f E gy
R ky Fl t E m t l T h l gy St

p d by

RADMS

P p d

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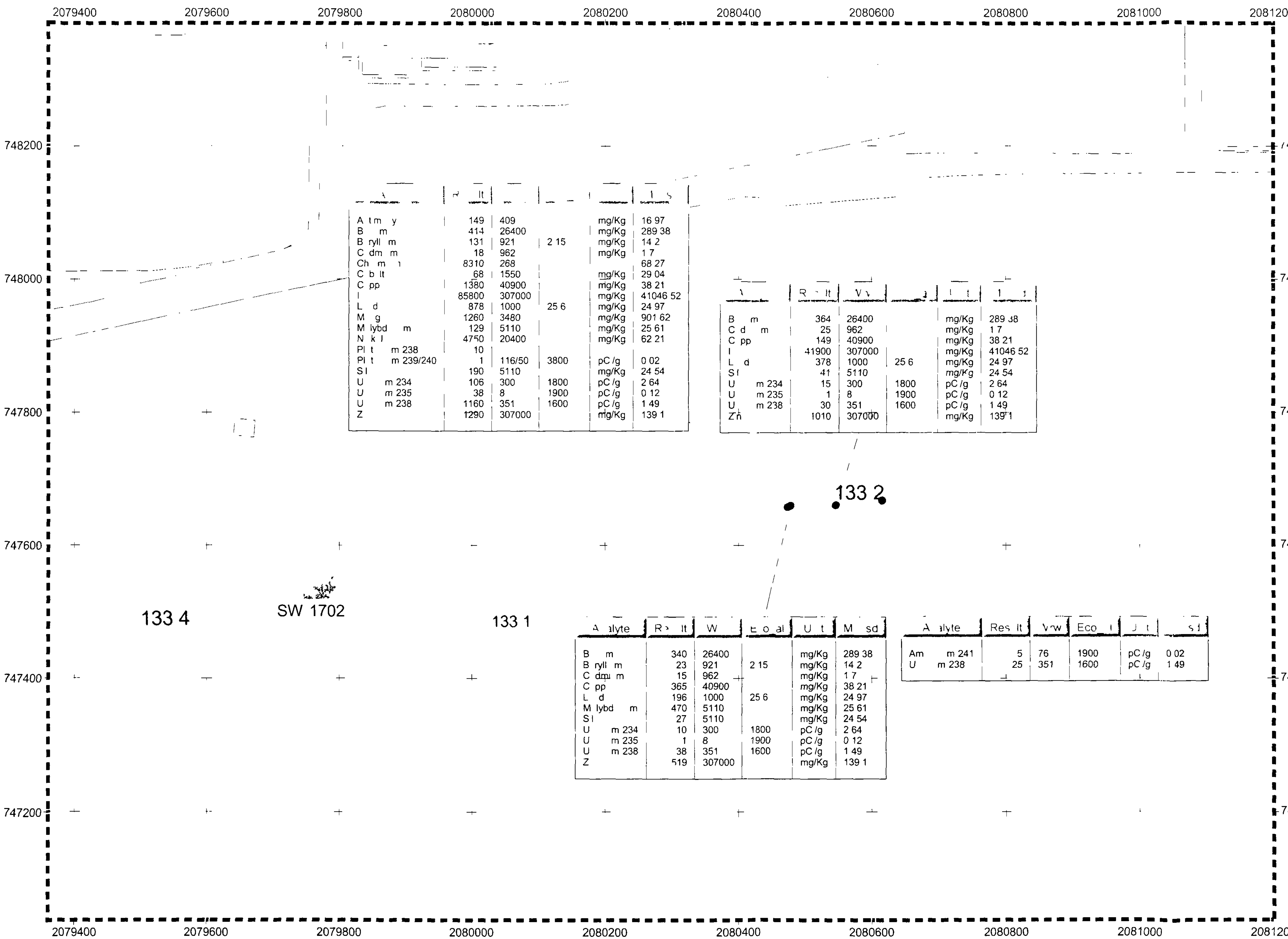

\	R lt				1 s
A t m y	149	409		mg/Kg	16 97
B m	414	26400		mg/Kg	289 38
B ryll m	131	921	2 15	mg/Kg	14 2
C dm m	18	962		mg/Kg	1 7
Ch m	8310	268			68 27
C b lt	68	1550		mg/Kg	29 04
C pp	1380	40900		mg/Kg	38 21
I	85800	307000		mg/Kg	41046 52
L d	878	1000	25 6	mg/Kg	24 97
M g	1260	3480		mg/Kg	901 62
M lybd m	129	5110		mg/Kg	25 61
N k l	4750	20400		mg/Kg	62 21
Pl t m 238	10				
Pl t m 239/240	1	116/50	3800	pC/g	0 02
S l	190	5110		mg/Kg	24 54
U m 234	106	300	1800	pC/g	2 64
U m 235	38	8	1900	pC/g	0 12
U m 238	1160	351	1600	pC/g	1 49
Z	1290	307000		mg/Kg	139 1

\	R lt	V		t	1
B m	364	26400		mg/Kg	289 38
C d m	25	962		mg/Kg	1 7
C pp	149	40900		mg/Kg	38 21
I	41900	307000		mg/Kg	41046 52
L d	378	1000	25 6	mg/Kg	24 97
S l	41	5110		mg/Kg	24 54
U m 234	15	300	1800	pC/g	2 64
U m 235	1	8	1900	pC/g	0 12
U m 238	30	351	1600	pC/g	1 49
Zn	1010	307000		mg/Kg	139 1

A alyte	R lt	W	E o al	U t	M sd
B m	340	26400		mg/Kg	289 38
B ryll m	23	921	2 15	mg/Kg	14 2
C dm m	15	962		mg/Kg	1 7
C pp	365	40900		mg/Kg	38 21
L d	196	1000	25 6	mg/Kg	24 97
M lybd m	470	5110		mg/Kg	25 61
S l	27	5110		mg/Kg	24 54
U m 234	10	300	1800	pC/g	2 64
U m 235	1	8	1900	pC/g	0 12
U m 238	38	351	1600	pC/g	1 49
Z	519	307000		mg/Kg	139 1

A alyte	Res lt	V w	Eco	J t	s
Am m 241	5	76	1900	pC/g	0 02
U m 238	25	351	1600	pC/g	1 49

Figure 4b

IHSS 133 2
Subusurface Soil
Maximum Sampling Results
Greater than Background
Means Plus Two Standard
Deviations

KEY

IHSS

PAC 1702

Paved area

D rt road

Stream ditch or drainage

Sampling location

N

30 0 3060 Feet

Scale 1 1 700

St t Pl C d t P j t
C l d C t IZ
D t m NAD 27

U S D p rtm t f E gy
R ky Fl t E m t l T h l gy St

d by

RADMS

P d f

KAISER HILL
C OMI N

Fl f
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2079200 2079400 2079600 2079800 2080000 2080200 2080400 2080600

748000 747800 747600 747400 747200

Analyte	Result	Wrw	Eco_al	Unit	M_2sd
Ura m-238	2	351	1600	pCi/g	1 49

Analyte	Result	Wrw	Eco_al	Unit	M+2sd
Ura m-238	2	351	1600	pCi/g	1 49

133 4

SW-1702

Analyte	Result	Wrw	Eco_al	Unit	M+2sd
Antimony	28	409		mg/Kg	16 97
Barium	637	26400		mg/Kg	289 38
Cadmi m	42	962		mg/Kg	1 70
Cobalt	34	1550		mg/Kg	29 04
Copper	957	40900		mg/Kg	38 21
Iron	107000	307000		mg/Kg	41046 52
Lead	935	1000	25 6	mg/Kg	24 97
Manganese	998	3480		mg/Kg	901 62
Nickel	93	20400		mg/Kg	62 21
Pluton m-239/240	1	50/116	3800	pCi/g	0 02
S lver	311	5110		mg/Kg	24 54
Tin	579	613000		mg/Kg	286 31
Uranium-234	113	300	1800	pCi/g	2 64
Urani m-235	17	8	1900	pCi/g	0 12
Urani m-238	244	351	1600	pCi/g	1 49
Zinc	2390	307000		mg/Kg	139 10

Analyte	Result	Wrw	Eco_al	Unit	M+2sd
Cadmium	14	962		mg/Kg	1 70
Copper	2520	40900		mg/Kg	38 21
Lead	163	1000	25 6	mg/Kg	24 97
Silver	56	5110		mg/Kg	24 54
Urani m-234	241	300	1800	pCi/g	2 64
Urani m-238	848	351	1600	pCi/g	1 49
Zinc	706	307000		mg/Kg	139 10

Figure 4c

IHSS 133 4
Subusurface Soil
Maximum Sampling Results
Greater than Background
Means Plus Two Standard
Deviations

KEY

- IHSS
- PAC 1702
- Paved area
- Dirt road
- Stream ditch or drainage
- Sampling location

N

50 0 50 Feet

Scale = 1 1 400

Stat Plane Coordinate Projection
Colorado Ce tral Zone
Datum NAD 27

U S Departme t f E ergy
Rocky Flats Envi o m tal Technology Site

Prepared by

Prepared for

KAISER•HILL COMPANY

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Date May 2003

Figure 4d

PAC SW 1702
Subusurface Soil
Maximum Sampling Results
Greater than Background
Means Plus Two Standard
Deviations

2079400 2079600 2079800 2080000 2080200 2080400 2080600

748000 747800 747600 747400 747200

Analyte	Result	Wrw	Eco_al	Unit	M+2sd
Uranium-238	2	351	1600	pCi/g	1 49

Analyte	Result	Wrw	Eco_al	Unit	M+2sd
Americium 241	3	76	1900	pCi/g	0 02
Arsenic	21	22 2	21 6	mg/Kg	13 14
Barium	1680	26400		mg/Kg	289 38
Beryllium	446	921	2 15	mg/Kg	14 20
Cadmium	71	962		mg/Kg	1 70
Chromium	434	268		mg/Kg	68 27
Cobalt	701	1550		mg/Kg	29 04
Copper	8850	40900		mg/Kg	38 21
Iron	97400	307000		mg/Kg	41046 52
Lead	5200	1000	25 6	mg/Kg	24 97
Manganese	2150	3480		mg/Kg	901 62
Molybdenum	68	5110		mg/Kg	25 61
Nickel	325	20400		mg/Kg	62 21
Plutonium-239/240	7	50/116	3800	pCi/g	0 02
Selenium	7	5110		mg/Kg	4 80
Silver	209	5110		mg/Kg	24 54
Uranium 234	350	300	1800	pCi/g	2 64
Uranium-235	68	8	1900	pCi/g	0 12
Uranium 238	940	351	1600	pCi/g	1 49
Zinc	7220	351	1600	mg/Kg	139 10

SW-1702

Analyte	Result	Wrw	Eco_al	Unit	M+2sd
Barium	380	26400		mg/Kg	289 38
Cadmium	35	962		mg/Kg	1 70
Copper	1150	40900		mg/Kg	38 21
Iron	106000	307000		mg/Kg	41046 52
Lead	881	1000	25 6	mg/Kg	24 97
Nickel	93	20400		mg/Kg	62 21
Plutonium-239/240	1	50/117	3801	pCi/g	0 02
Silver	125	5110		mg/Kg	24 54
Uranium-234	21	300	1800	pCi/g	2 64
Uranium-235	1	8	1900	pCi/g	0 12
Uranium-238	17	351	1600	pCi/g	1 49
Zinc	1420	351	1600	mg/Kg	139 10

KEY

- IHSS
- PAC 1702
- Paved area
- Dirt road
- Stream ditch or drainage
- Sampling location

N

30 0 30 60 Feet

Scale = 1 1 300

State Plane Coord ate Projection
Colo ado C ntral Zone
Datum NAD 27

U S Department f Energy
Rocky Flats Environmental Technology Site

Prepared by:

Prepared for:

KAISER•HILL COMPANY

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posting map for subsurface apr Date May 2003